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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
TAKESHI MIYAKAWA, ET AL.	: EXAMINER: CHEVALIER, ALICIA A.
SERIAL NO: 10/030,160	: GROUP ART UNIT: 1772
FILED: JANUARY 30, 2002	: RCE FILED: OCTOBER 27, 2004
FOR: SHEET FOR AN EMBOSSED CARRIER TAPE	:

DECLARATION UNDER 37 C.F.R. § 1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

I, Takeshi Miyakawa, a citizen of Japan, hereby declare and state that:

1. I am a co-inventor of the above-identified application.

2. The specification discloses tear strength and carrier tape strength for Examples 1-5 and Comparative Examples 1-4 at page 9, Table 1, which is reproduced in Table A below.

Table A

Item (unit)		Base layer	Surface layer	Sheet thickness (μm)	Tear strength (N/mm)	Carrier tape strength (N)	Carrier tape tensile strength (N/mm^2)
Examples	1	PC + CB		300	162	109	15
	2	ABS	PC + CB	200	143	82	17
	3	PET + CB		300	137	129	18
	4	ABS	PS (E640N) + CB	400	126	100	10
	5	MS (TP-URX) + CB		500	117	64	5.3
Comparative Examples	1	PS + CB		300	78	42	5.8
	2	MS (TP-SX) + CB		500	82	45	3.8
	3	ABS	PS (HRM-20) + CB	300	64	38	5.3
	4	PS(HRM20)	PC + CB	200	72	35	7.3

As discussed in the specification at page 8, lines 13-22, in Examples 1-5 a carrier tape strength of at least 60 N was obtained, whereas in Comparative Examples 1-4 the carrier tape strength was less than 50 N. With respect to each of the embossed carrier tapes of Examples 1-5 and Comparative Examples 1-4, a mounting test for emboss 100 pockets was carried out by using a mounting machine with a component mounting tact of 0.1 sec/component. In Examples 1-5 the embossed carrier tape did not break, whereas in Comparative Examples 1-4 the embossed carrier tape broke.

In addition to the tear strength (N/mm) and carrier tape strength (N) data found in Table 1, Table A includes carrier tape tensile strength (N/mm^2) data for Examples 1-5 and Comparative Examples 1-4. The carrier tape tensile strength data was obtained using the following formula (tape width = 24 mm, specification at page 5, line 15):

carrier tape tensile strength = (carrier tape strength)/[(sheet thickness)(tape width)]

In Example 1, e.g., carrier tape tensile strength = 15 N/mm^2 (= (109)/[(300x10^{-3})(24)]).

Table A shows that in Example 5, the carrier tape tensile strength is 5.3 N/mm^2 and the tear strength of the sheet is 117 N/mm. In Comparative Example 1, the carrier tape tensile strength is 5.8 N/mm^2 and the tear strength is 78 N/mm. In Comparative Example 4, the carrier tape tensile strength is 7.3 N/mm^2 and the tear strength is 72 N/mm. These results indicate that even when the tensile strengths of the carrier tapes are at the same level, the tear strengths thereof may sometimes become low. Thus, it is meaningful to define the lower limit of the tear strength.

3 . Results of experiments

The following experiments were carried out by me or under my direct supervision and control.

(1) Purpose

In the present invention, by using a sheet having a tear strength of at least 105 N/mm as defined in JIS-K-7128-3, it is possible to obtain an embossed carrier tape useful for high-speed mounting. In the following experiments, in relation to the breakage of the embossed carrier tape, the tensile breakage strength and tear strength of the sheet and the tensile strength of the embossed carrier tape were measured, and the relations were studied.

(2) Experiments

(2-1) Materials used

A: "SE-10", ABS resin, manufactured by Denki Kagaku Kogyo K.K.

B: "E640N", PS resin, manufactured by Toyo Styrene Co., Ltd.

C: Acetylene black grains, carbon black manufactured by Denki Kagaku Kogyo K.K.

D: "APT-3010", ABS resin manufactured by Denki Kagaku Kogyo K.K.

E: Electrically conductive compound resin obtained by preliminarily kneading B and C at the ratio of B:C=80:20 by mass% and pelletizing it by means of a ϕ 50 mm vent type biaxial extruder.

(2-2) Preparation of samples

Sample 1: Using A as a base layer and E as a surface layer, by means of a feed block method using a ϕ 65 mm extruder (L/D=28) and a ϕ 40 mm extruder (L/D=26) and a T-dye having a width of 500 mm, a sheet for an embossed carrier tape, having a total thickness of 200 μm and a thickness of each electrically conductive resin composition layer of 20 μm at both sides of the base layer was produced. This sheet was slit into a width of 24 mm to obtain an embossed carrier tape having pocket size of 12 mm × 15 mm × 5.5 mm and having a width of 24 mm by means of a carrier tape forming machine manufactured by EDG.

Sample 2: Using D as a base layer and D as a surface layer, by means of a feed block method using a ϕ 65 mm extruder (L/D=28) and a T-dye having a width of 500 mm, a sheet for an embossed carrier tape, having a total thickness of 200 μm was produced. From this sheet, an embossed carrier tape was produced in the same manner as in the above process for producing Sample 1.

(2-3) Method of evaluation (see attached Fig. 1 for reference)

(2-3-1) Tensile breakage strength was measured in accordance with JIS-K-7127, and the sheet for an embossed carrier tape was subjected to a tensile test by means of a strograph tensile tester using a number 4 test piece at a tensile rate of 10 mm/min.

(2-3-2) Tear strength was measured in accordance with JIS-K-7128-3, and the sheet for an embossed carrier tape was subjected to a tensile test by means of a strograph tensile tester at a tensile rate of 200 mm/min.

(2-3-3) Strength of the embossed carrier tape was measured by a tensile test by means of an autograph tensile tester with a chuck space of 32 mm at a tensile rate of 10 mm/min.

(3) Results

Table B

	Sheet		Embossed carrier tape
	Tensile breakage strength	Tear strength	Strength
(Unit)	(N/mm^2)	(N/mm)	(N)
Sample 1	35	171	71
Sample 2	33	70	33

(4) Conclusion

In Samples 1 and 2 the tensile breakage strength of the sheet is about the same. However, in Sample 2 the tear strength of the sheet is about 41% (= (70/171)(100)) that of Sample 1, and the strength of the embossed carrier tape is about 46% (= (33/71)/(100)) that of Sample 1.

The results in Table B show that the strength of the embossed carrier tape can be significantly improved by increasing the tear strength of the sheet to at least 105 N/mm.

4 . I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

5 . Further declarant saith not.

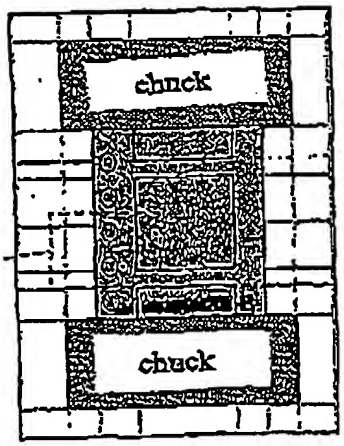
Date: 08/07/2005 Takeshi Miyakawa

Takeshi Miyakawa

Attached: Fig. 1

Report of experiment (photograph)

Schematic view of carrier tape tensile test



The site at which the photograph was taken

Photographs before and after the measurement of carrier tape strength
Method: by microscope (Toyo Seiki K.K.)
Magnification: x 1.0 time

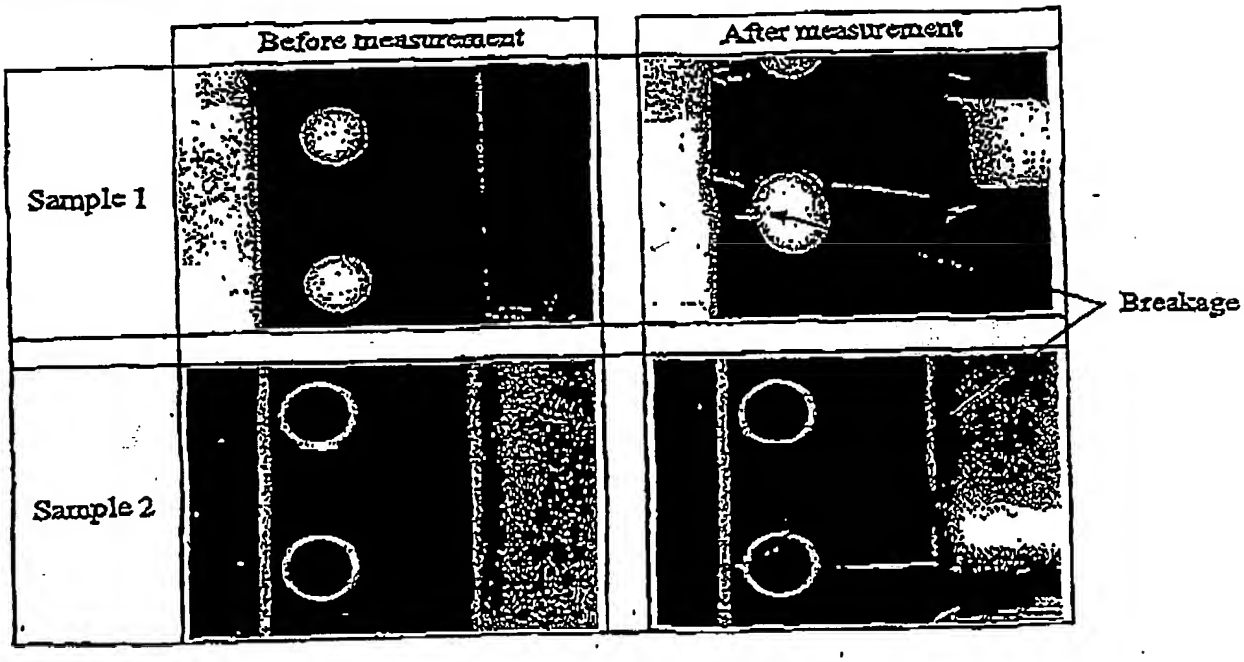
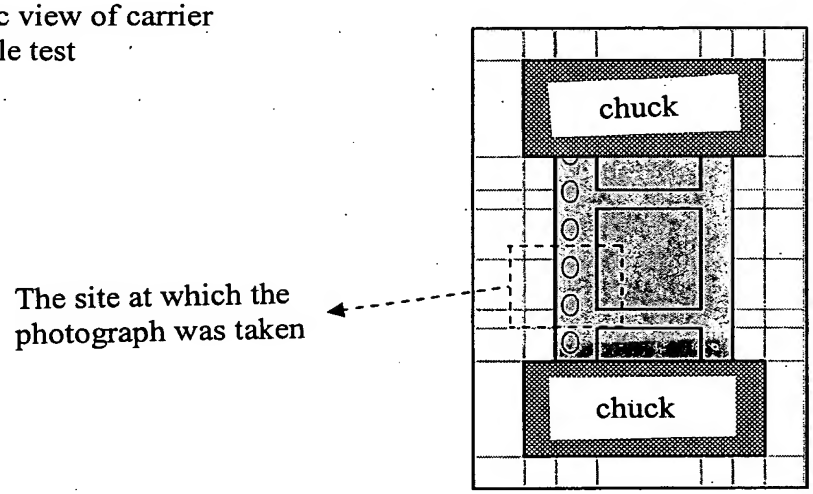


Fig. 1

Report of experiment (photograph)

Schematic view of carrier tape tensile test



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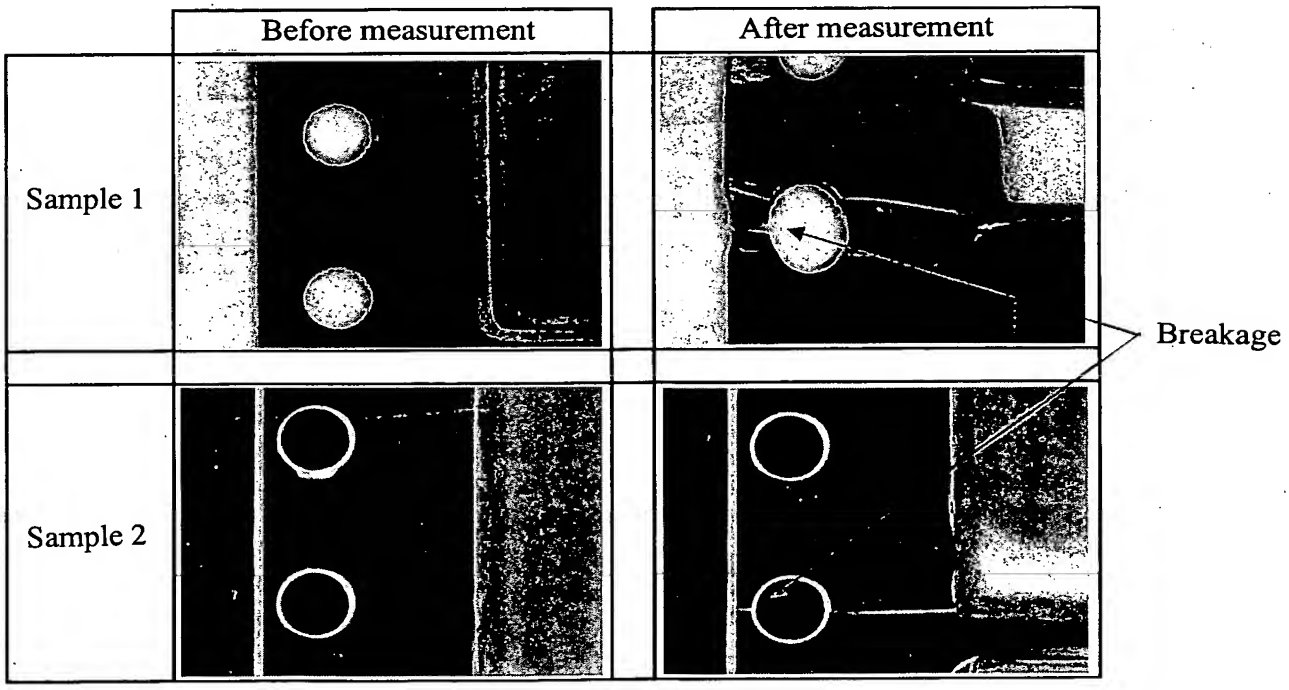

Fig. 1